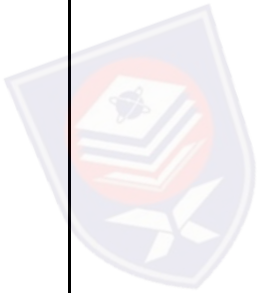


THE IMPLEMENTATION OF PERSUASIVE TECHNOLOGY PRINCIPLES
IN MOBILE APPLICATION DEVELOPMENT: A QUALITATIVE STUDY

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ABSTRACT

Preceding studies of persuasive technology have mentioned several benefits on the implementation of persuasive design features of the Persuasive System Design (PSD) model such as creating users' engagement and acceptance and continuous usage. However, available literatures have not sufficiently address the implementation of these design principles particularly in the context of mobile application development as compared to system development. Furthermore, there are low numbers of discussion that have relate the implementation of these design principles towards the achievement of the persuasive system developed. Hence, this study was conducted to qualitatively explore the way persuasive design principles were implemented as well as the mobile application development processes followed in three different levels of mobile applications' attainments. Within this study, seven semi-structured interviews were conducted with the involvement of fifteen (15) Android mobile applications in the area of utilities category. These mobile applications were then categorized into successful, partially successful and less successful categories based on their numbers of mobile application downloaded for three consecutive years which is from 2013 until 2015. The results from the content analysis conducted have shown that the mobile applications of the successful category have implemented a lot more persuasive design principles as compared to the other two categories. Moreover, it is also found that all of the mobile applications of the category had follow a more detailed process of mobile application development with the emphasizing on product introduction to the users. A model of the implementation of persuasive design principles in mobile application development was then proposed based on the findings gained from this research. The results from this study have provided contribution to the body of knowledge by leveraging the domain of persuasive technology studies particularly in mobile application development.

ABSTRAK

Kajian-kajian lepas teknologi *persuasive* telah menyebut beberapa manfaat berkaitan implementasi ciri-ciri reka bentuk *persuasive* daripada model *Persuasive System Design (PSD)* seperti mewujudkan penglibatan yang aktif dan penerimaan teknologi dari pengguna serta penggunaan teknologi secara berterusan. Walau bagaimanapun, kajian literatur sedia ada tidak membincangkan secara mendalam mengenai implementasi prinsip reka bentuk ini terutamanya bagi pembangunan aplikasi mudah alih jika dibandingkan dengan kajian yang telah dijalankan bagi pembangunan sistem. Malah, perbincangan yang mengaitkan antara implementasi prinsip reka bentuk ini terhadap pencapaian sistem *persuasive* yang telah dibangunkan adalah amat sedikit. Oleh itu, kajian ini telah dijalankan untuk meneroka secara kualitatif cara prinsip reka bentuk *persuasive* diimplementasi dan proses yang terlibat bagi membangunkan aplikasi mudah alih tersebut. Bagi kajian ini, tujuh separa-struktur temu bual telah dijalankan melibatkan lima belas (15) aplikasi mudah alih Android dari kategori utiliti. Aplikasi mudah alih ini kemudiannya dikategorikan kepada kategori berjaya, separa berjaya dan tidak berjaya berdasarkan kepada bilangan muat turun aplikasi sepanjang tiga tahun iaitu daripada tahun 2013 hingga 2015. Dapatan daripada analisis kandungan menunjukkan aplikasi mudah alih daripada kategori berjaya telah mengimplementasi lebih banyak prinsip reka bentuk *persuasive* jika dibandingkan dengan dua kategori yang lain. Tambahan lagi, aplikasi mudah alih daripada kategori berjaya juga telah melalui proses pembangunan yang lebih terperinci dengan memberikan penekanan kepada pengenalan produk kepada pengguna. Sebuah model implementasi prinsip-prinsip reka bentuk *persuasive* juga telah dicadangkan berdasarkan kepada dapatan yang diperoleh daripada kajian ini. Dapatan dari kajian ini juga telah menyumbang kepada bahagian ilmu dengan memanfaatkan kajian teknologi *persuasive* terutamanya dalam pembangunan aplikasi mudah alih.

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LIST OF ABBREVIATIONS

MCMC	-	Malaysian Communications and Multimedia Commission
SMS	-	Short Message Services
MMS	-	Multimedia Messaging Service
SMS	-	Short Message Service
ICON	-	Integrated Content Development
MDeC	-	Multimedia Development Corporation
MSC	-	Multimedia Super Corridor
SMA	-	Successful Mobile Applications
PSMA	-	Partially Successful Mobile Applications
LSMA	-	Less Successful Mobile Applications

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PTTA UTHM
PERPUSTAKAAN TUNKU TUN AMINAH

INTRODUCTION

1.1 Introduction

The level of mobile phone usage among Malaysians has been proliferating annually. Malaysian Communications and Multimedia Commission (MCMC) (2014) analysed the data from the 14 states in Malaysia and concluded 85% of Malaysians have at least a mobile phone in the year 2012. In another study by Malaysia Digest (2015) found that Malaysia is among the countries in Asia to be most affected by the expeditious evolution of the telecommunication wave. Fundamental capabilities and features of mobile application such as making phone and video calls, delivering Short Message Services (SMS) and Multimedia Messaging Service (MMS), playing music through MPEG Audio Layer 3 (MP3), playing games, watching videos and browsing the internet are among factors driving the use of mobile phones (Shiang-Yen et al, 2012; Zulkefly and Baharudin, 2009).

Furthermore, the evolution of telecommunication wave has elevated the fundamental capabilities and features of mobile phones when mobile application store was then introduced to the users as a platform that allows them to download various of applications in an instant and has led to the increasing number of mobile phone usage globally (Lane et al., 2010). The unique features of mobile applications that can be

operated on small and moveable devices such as smartphones and tablets have make it easier to access everywhere and more persuasive compared to the other computing products hence these features have become part of the reasons for users to become more attached to their mobile phones. Realizing the higher demand and the beneficial outcomes from this exponential growth industry, mobile developers have been dilating the range of mobile application areas as to cater the users' demand while researchers are finding better as well as improved solutions and approaches in various facets that includes hardware, software, platforms and functionalities. This is to ascertained that this field of study will achieve favourable outcomes in accordance to the context of mobile applications study and to breed new innovation success in the world of digital mobile applications.

Therefore, this study focuses on the implementation of persuasive technology practices in the mobile application development. As an introduction, this chapter provides general overview of current statistics on mobile application markets globally as well as in Malaysia. The determinants for mobile application success and the correlation with persuasive technology principles also be discussed. Throughout this chapter, the problems that were associated with the context of research, research questions, research objectives, research scope, significance of this research, operational definition as well as thesis structure is presented.

1.2 Research Background

Statistics have shown that the increasing numbers of smartphone users have affected towards the escalation numbers of mobile application usage globally (Saifi, 2017 and Lella, 2015). A report released by Go-Globe (2017) has indicates that there are almost 2 million mobile applications released in the Apple Store while Google Play has almost 2.2 million mobile applications and these numbers are expected to grow. As the numbers of mobile applications have reached the new height, Gartner (2017) and Warman (2016) have estimate that the revenue gained from this industry can reach towards almost \$77 billion in 2017.

The growth of mobile application industry also has been experienced in Malaysia and according to Wong (2014), Malaysia has the highest number of mobile penetration compared to Indonesia, Thailand and United States. This phenomenon can be seen through the increasing number of the mobile application developers as well as companies investing in Malaysia's mobile application market (SKMM, 2016). Figure 1.1 shows the estimated number of mobile applications downloaded in Malaysia between 2009 until 2017. Furthermore, a statistic released by MSC Malaysia (2015) has estimated there will be almost \$15.5 million revenue by 2017 generated by this industry.

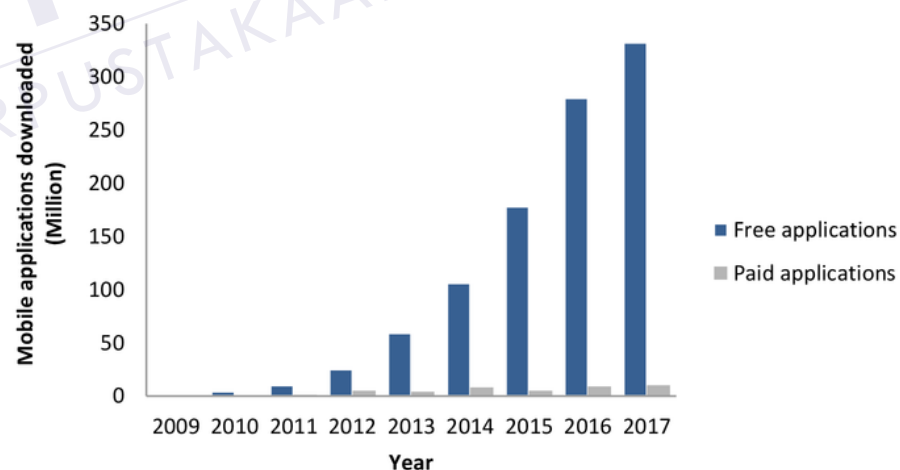


Figure 1.1: Estimated number of mobile applications downloaded in Malaysia (SKMM, 2015)

In line with the market development of mobile applications and advances in information technology and digital content and creative industries in Malaysia, various efforts have been undertaken by the government to help improve the development of local industries by Malaysians (RMK-9, 2009). The government believes that manufacturing and services in the field of information technology and telecommunications, which involves the development of creative digital content has great potential in Malaysia (RMK-9, 2009). It should continue to develop and further enhance the market value of this industry on a par with other countries. MSC Malaysia (Multimedia Super Corridor Malaysia) has created a platform for the development of this industry and provides a fund of RM75 million in August 2009 to raise the level of competence and capabilities in order to boost the involvement of Malaysians in this industry (RMK-9, 2009).

Among the initiatives that have been created is the ICON program (Integrated Content Development) which was initiated in 2009 by MDec (Multimedia Development Corporation). ICON primary purpose is to produce more local application developers to provide support and assistance to those interested in creating quality web and mobile applications. MDec is one of the government's efforts to act as a liaison between users and developers. Following the success achieved by ICON and ICON2 program, ICON3 have been created and more focused enterprise applications that provide an opportunity for participants to access the wider economic opportunities in the market that is growing rapidly.

As to increase the market value of mobile applications, the resulting product must meet or exceed the needs of users and at the same time maintaining the momentum of a marketing strategy that will benefit (Shiang-Yen *et al.*, 2012). To meet the customers' requirements, application developers need to be focused on the principles of persuasive during the planning process and the development of smart applications for products developed to attract users and keep users to continue using the application (Fogg, 2012). This in turn can help to improve the product in the market of mobile applications. In the same time, these efforts can support the government's aspiration to make Malaysia as one of the countries that are active in producing interactive and useful to users in various areas through mobile applications and other technologies.

1.3 Problem Statement

The current growth of the mobile application industry by 2016 has expected to continue to grow (Pourrazavi et al., 2014). Previous study by Rakestraw, Eunni and Kasuganti (2013) has reported that the growth of mobile application market has shown no signs of slowing, with as many as 15,000 new applications being released every week. However, Numbers of articles and research have point out that one in four mobile applications never being used after downloaded or the applications were tried once and never being used again. Another study has indicated that despite the huge numbers of mobile applications being released every day, the perceived quality of each application does not have much practical value and well designed. As a consequence, users will either uninstalled or stopped using the mobile applications and make them prefer not to download the company's product in a future time (Dimensional Research, 2015). Therefore, an in-depth study needs to be done to examine the way persuasive technology practices were implemented in mobile applications development because it is claimed to help users to achieve their goals better (Oinas-Kukkonen et al., 2003).

Furthermore, despite the growing number of persuasive technology research globally, researches on the use of persuasive technology specifically for the development of mobile application are still limited.

Table 1.1: Literature scans for the research done relate to persuasive technology and captology (Source: Writer)

	Science Direct	Scopus	ACM Digital Library	Emerald Insight	IEEE Xplore	Proquest
Persuasive technology	34	128	264	26	60	32
Persuasive technology AND mobile application	2	6	16	0	2	1
Persuasive technology AND mobile application AND Malaysia	1	-	-	-	-	-
Captology	-	8	13	2	4	7
Captology AND mobile application	-	2	1	-	1	1
Captology AND mobile application AND Malaysia	-	-	-	-	-	-
TOTAL	37	144	294	28	67	41

Table 1.1 shows that despite wide range of studies on persuasive technology; there are hardly any on mobile application. Furthermore, most of the research studies done on persuasive technology are either based on the improvement, assessment or application of the theory for systems or application development. The discipline of persuasive technology is still at its infancy thus the theory itself needs refinement and empirical support. This necessitates the need to identify the empirical gap in persuasive technology studies especially in the mobile application context especially in Malaysia. As from the small fractions of 102 mobile applications and persuasive technology studies, these studies have only been concentrated on the implementation of particular persuasive principles in

mobile applications development tested as a tool. In another study by Chatterjee and Price (2009) have questioned whether the development of mobile applications with the references of persuasive principles could bring the same result as in the implementation of the theory in system development. In this manner, it is imperative that further study must been done to assess the implementation of persuasive principles to ensure mobile acceptance because of the unique capabilities of mobile where users can be reached easily through mobile hence making them as a compelling and the most convenient platform for applying the persuasive design.

Furthermore, several studies have shown that persuasive principles are part of important components in the mobile application acceptance (Alhammad and Gulliver, 2014). Furthermore, there are several studies have reported that the implementation of persuasive principles in mobile application development as part of the functions and to support the features of the mobile applications could encourage users for continuity usage, create user engagement as well as adherence towards the software products. Thus, technology experts have given more attention by developing mobile applications based on persuasive design theory. However, Mintz and Aagard (2012) have questioned the implementation of the persuasive technology theory since previous studies of implementation of persuasive technology principles have not dealt with all types of mobile application apart from health, e-commerce and education fields. In addition to that, most literatures of previous studies only have discussed from the perspective of users instead of the developers. Hence, this suggests that an in-depth study should be done to enable it to be applied to the development of mobile applications in a bigger scope apart from the usual context and gain the same outcome as have been proven from the former studies.

1.4 Research Questions

Based on the problems describes in 1.3, ¹⁸⁸ this study aimed to address the following research questions:

- (i) RQ 1: How persuasive technology are being incorporated in most successful, partially successful and less successful mobile applications.?
- (ii) RQ 2: How persuasive technology design are being applied in enhancing the success level of the mobile applications?

1.5 ¹⁴⁶ Research Objectives

The major objectives of this study are:

- (i) RO 1: To explore the principles of persuasive technology incorporated in most successful, partially successful and less successful mobile applications.
- (ii) RO 2: To explore the persuasive technology design that are able to enhance the success level of the mobile applications.

1.6 Research Scope

This study focuses on the mobile applications developed not for the sole purpose of persuasion as to discover the persuasive design principles implemented and to explore the persuasive technology design followed for developing the mobile applications involved. Furthermore, Android mobile applications of the utilities category were chosen as to assess whether the persuasive principles are suitable to be implemented in other areas or domains of mobile applications. Then, these mobile applications were categorized into three distinctive categories which were classified as successful, partially successful and less successful category of mobile applications. The classifications were made based on their numbers of mobile applications downloaded in the range of three consecutive years.

The relevance for this is to enable the researcher to compare the aftermath ¹³ of the persuasive design principles implemented towards the attainment of the mobile applications. For the information gathering process, several in-depth interviews were conducted with the project leaders, mobile developers and programmers. The selection of the interviewee was made based on their experiences and their capability as well as the understanding on the software products which they have planned, developed and released to the users. This information is substantial in gaining data richness and completeness for the data analysis process of this study.

¹²³ 1.7 Significance of the Research

The significance of this study theoretically is to prove that the principles of persuasive system design can be applied to the other fields of mobile applications other than the field of commercialization, education and health. In addition, with the study of this research it is hoped that it will encourage the mobile applications developers to implement these principles of persuasive technology and used it as a guideline so that the objective of mobile application development will be successfully delivered and it could allow user acceptance, be fully utilized by the users, and encourage continuity usage. Indirectly, it can assist to boost the commercialization for the mobile application.

Moreover, the importance of this study from the practical perspective is to increase the understanding of mobile application developers towards this theory and the advantages that can be obtained. The comprehension of this theory can act as a guideline to assist the developers to study the needs and requirements of users for the application to be developed. Given this process, developers can design and develop applications more carefully on the aspects which need to be emphasized so that the objective of the applications development can be attained and these applications can also be fully utilized by the users.

1.8 Structure of the Thesis

The structure of the thesis provides an overview of the course of research and organization of ideas so that there is continuity between one section and another section. Therefore, the content of each chapter is involved in this research are as follows:

Chapter 1 contains an introduction and background to the research conducted, the problems associated with the study, questions and objectives of the study, research scope and the importance of the research carried out.

Chapter 2 was divided into two main parts in which each section was discussing on the essence for this research. The first part provides the overview of the persuasive theories in order to answer the research questions that arise in this study. Definitions of persuasive and persuasive technology were described in this chapter. This chapter also describes the evolution of persuasive technology. In fact, the theories of persuasive the previous that will be used during the research will be discussed further in this chapter. In fact, the underpinning social psychological theories and the model and framework of persuasive technology were also discussed. For the second part, further discussion was made on the software processes activities as well as the persuasive system design. This chapter end with explanations on theoretical framework and summary.

Chapter 3 explains the research methodology. It discusses more about the qualitative method used in this research. Design methodology, methods and strategies selected appropriate studies and justification of the selection will be discussed in this chapter. In addition, techniques and procedures for data collection, sampling study and analyse process data are also discussed.

Chapter 4 discusses about the process of analysing the data. The results of the data collection will be analysed by some persuasive theories that have been discussed in Chapter 2.

Chapter 5 discusses the results of the data that has been analysed whether it was answering the research questions and achieves the objectives that have been set out in Chapter 1. The conclusions of the study will be discussed in this chapter. Furthermore, recommendations for further research in the future are also disclosed.



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